Space Weather Forecast

Issued on Sunday, 26 November 2023 at 13:08 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Isolated Moderate flares/R1-R2 Radio Blackouts likely throughout. Chance of Minor Geomagnetic Storms Days 1-2 (25-26 Nov).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low, with a peak Common-class flare from near the eastern limb at 25/1440 UTC. There are currently eleven sunspot groups on the visible disc, the majority of which are located in the eastern half of the solar hemisphere. Near centre disc in the northern hemisphere there is a cluster of four sunspot groups that appear to be contained within the same area of plage and magnetically connected. The largest group is a magnetically complex region in the southeast. One region in the southwest of the disc has shown recent growth and a slight increase in complexity. The other groups remain comparatively small and more magnetically simple.

No Earth-directed Coronal Mass Ejections (CME) have been observed in the past 24hrs.

Solar Wind / Geomagnetic Activity: Solar wind parameters have been at elevated levels around 520-550 km/s since the arrival of a CME that left the Sun on 22 Nov, as well as the possible connection to a high speed stream (HSS). The Interplanetary Magnetic Field (IMF) was initially Moderate following the CME arrival, before a slow but steady decline has been observed since, and is currently at Weak levels. The important north-south component was predominantly southward upon the CME arrival. Since 25/2100 UTC it has varied weakly. The resultant geomagnetic activity was initially at G1/Minor Storm levels (Kp5), increasing to G2/Moderate Storm levels (Kp6) between 25/1800-2100 UTC, before decreasing to Unsettled (Kp4) after that. It has since dropped slightly further to Unsettle levels (Kp3) since 26/0300 UTC.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is expected with isolated Moderate class flares and a slight chance of a Strong flare. The main flare risk is from regions currently positioned on the eastern solar hemisphere and from the cluster close to centre disc in the north.

Solar Winds / Geomagnetic Activity: Two possible Coronal Mass Ejections (CME) feature in the forecast. Firstly, the southwards directed CME observed from late 22 Nov, which may have already arrived, and secondly, the CME that resulted from the Moderate flare on 24 Nov, which has been modelled as a slight chance of a glancing blow on Day 2 (27 Nov).

Solar winds are currently enhanced following the recent CME arrival(s) and are at elevated levels, between 500-550 km/s. There is some uncertainty if these elevated wind speeds are currently due to connection with a high speed stream (HSS) or due to lingering enhancement from the earlier CME arrival. It is probable that the Earth is connected to the HSS, and so solar

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winds are forecast to remain at, or close to, elevated levels through Days 1-2 (26-27 Nov). With the uncertainty in CME arrivals during these days, there remains the possibility for winds to increase, perhaps to strong levels (600 km/s) at times. As such, there is significant uncertainty in the short term forecast. Solar winds are expected to drop back to more ambient levels from Day 3 (28 Nov) onwards, as CME and HSS effects ease.

Geomagnetic activity is currently Quiet/Unsettled (Kp2-3), and will likely remain similar through Days 1-2 under the influence of the HSS, with Active intervals likely. If any of the CMEs mentioned do arrive on Days 1-2 then there is a chance for G1/Minor Storm intervals (Kp5), as well as a slight chance for G2/Moderate Storm intervals (Kp6), as these CME effects combine with the HSS. From Day 3 (28 Nov) onwards, geomagnetic activity is expected to fall back to mostly Quiet levels (Kp1-2).

Energetic Particles / Solar Radiation: No solar radiation storms are expected. However, there is a slightly higher risk of observing S1/Minor Storm conditions compared to normal, given the number of sunspots currently on the disc and their propensity to move into a more favourable location on the disc for connection with Earth in the coming days.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	50	20	2	1
Strong	G3	No	10	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	60	60	60	60
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	15	15	15
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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